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Digital skills in the development of creativity of teachers of a public university in lima

Giancarlo Roosevelt Contreras Moreno

Universidad Privada César Vallejo, Perú

Email: dr.giancarlorcm@hotmail.com

Héctor Raúl Santa María Relaiza

Universidad Privada César Vallejo, Perú

Email: elsanta17@gmail.com

Katherine Talía Ganoza Salazar

Universidad Nacional Federico Villarreal, Perú

Email: taliaganozas@gmail.com

Lizbeth Giovanna Toribio Alejo

Universidad Peruana Los Andes, Perú

Email: glibeth58@gmail.com

Abstract---The study set out to determine how digital skills influence the development of teachers' creativity. The paradigm was positivist; the type of research, basic with a causal correlational transectional non-experimental design; the approach was quantitative and the type of sampling, probabilistic. Regarding the sample, it was composed of 123 teachers. For data collection, two questionnaires with high reliability and internal consistency were used, reaching 0.779 for the digital skills questionnaire and 0.802 for the development of creativity. The results indicated that 2.4% of the respondents showed an inadequate level of digital skills and 16.3%, a medium level in relation to the development of creativity. Likewise, a Wald score of 1259.565 with a significance of 0.000 was obtained, the fit of the model and Pseudo R2 shows a Nagelkerke value of 0.428; and the likelihood ratio contrast test indicates that the logistic model is significant with a Chi square of 11.299. It is concluded that digital skills significantly influence the development of creativity.

Keywords---Creativity, digital literacy, critical thinking, digital citizenship, digital competence.

Introduction

Worldwide, education took a transcendental change due to covid 19, which has affected countries in the region, especially Peru. Face-to-face education began to take place remotely, which generated various strategies to execute the teaching-learning process. The governments of different countries made immediate decisions in the educational field so that the academic year was not lost. In Ecuador, educational institutions were not prepared for remote education due to many circumstances and one of them is the provision of technological resources, in addition to the fact that teachers, in their initial training, were not prepared for online education; It was brought to light that the Ecuadorian educational system had to enter an emergency both due to the need for technological resources, as well as the preparation of teachers. Although Ecuador has a comprehensive technology system that aims to improve digital learning in rural areas , it did not achieve the goal due to lack of technological resources (Tipanluisa, 2021) .

Technology advances and teachers must be at its level in order to give the best for students in the acquisition of new knowledge, generating capacities and making them creative and autonomous students. The performance of teachers, in times of confinement, has generated discomfort and criticism from society and parents without understanding that teachers did not master the different existing digital applications and, therefore, did not develop digital skills due to ignorance of technological resources, these being the only tools that should be used to be able to maintain teacher-student communication and, in this way, continue with the teaching process; Added to this problem is the fact that, in the countries of the region, many of the regular basic and higher education institutions do not have internet, mainly in rural areas, being a problem for low-income students (Basantes et al . al., 2020) .

It is important to mention that digital skills must be integrated and applied together with technological tools since they are decisive in educational practice and these must be developed by the university teacher in the teaching process; but, if the universities do not have the technological resources, it will not be possible to develop the skills and abilities of both teachers and students (Vargas, 2019) . In this context, the universities of the region have adopted various strategies on the use of technology, allowing them to strengthen joint work and put into practice professional skills that are required today. At present and in the context in which we live, the use of technological environments is required, for example, of social networks, managing to decentralize information and thus make permanent monitoring and evaluation by teachers (Flores and Garrido , 2019) . The appearance of web applications has allowed teachers to search for strategies that allow managing the teaching process and promoting new learning that is important for the autonomy and creativity of students (Escuder et al., 2020) . In the space where education is given, technological tools are very useful because they achieve the interaction and contact of people with common interests, they also allow active participation and that the methodology used by teachers is reinforced with the use of applications. webs (Georges, 2021) .

In Peruvian universities, digital skills are seen as a relevant and structural element within the development of knowledge in order to train human capital, this being a fundamental element for changing society. It should be noted that, at present, online education, known as e-learning, is based on the use of web applications to create a personalized, interactive and reflective learning environment system both in time and space; but it is necessary for the teacher to master and develop digital skills, this being a problem for many teachers at Peruvian public universities.

Today, education in Peruvian universities takes place in a virtual environment, forcing teachers to be trained in technology, thus developing digital skills; it would be ideal for teachers to master existing digital tools; but, in practice, this is not the case since the teaching-learning methodology remains disconnected from reality (García et al., 2021) . Education must go hand in hand with the transformational changes of globalization where the methods, skills and technological tools respond to the demands of remote education as it is currently being developed (Escobedo and Solórzano, 2018) . In this sense, the following question is formulated: how do digital skills influence the development of creativity of teachers of a public university, 2021?

Theoretical framework

According to the review of the state of the art, research on the variables from the international sphere was found. For example, Domínguez (2019) argued that it is necessary to establish a model based on the development of competencies and that this should focus on the training of pedagogical professionals who allow learning to be created and imagined as an accessible element and who have the ability to extrapolate in the different context and times, combining elements of modality and moments of academic learning, achieving the optimization of professional instruction in student well-being. Similarly, Fernandez et al. (2017) argued that digital skills are influential in the university environment. Lopez et al. (2021) determined that teachers lack digital skills within the proper management of technological equipment and, as a consequence, it brings a low level in the process and comprehensive development of the student. For his part, Alvarado (2018) argued that, within the teaching-learning process, the constant problem is the low production of ideas, this should be tackled in a creative way. In this regard, Medina et al. (2019) mentioned the importance of teachers accepting inclusion as a creative method since it has not been extended and used, which has limited the possibilities of developing creativity in students.

Laurente et al. (2020) argued that university teachers have managed to find new ways of teaching and learning by combining face-to-face learning experiences and the virtual context, managing to propose innovative modalities where educational interaction occurs that allows the development of research. Likewise, Levano et al. (2019) concluded that university teachers and universities must be at the forefront of transformations both in infrastructure-university and in the academic-teacher character, being necessary elements to be located in the world of digitization in order to face the new education. digital.

Rojas et al. (2020) ratified that the professors are at a basic level on the knowledge and practice of digital skills, highlighting the competence of content creation that they dominate the most. In the same way, Saavedra et al. (2020) pointed out that pedagogy allowed students to develop creativity and critical thinking. In this regard, Hurtado (2021) concluded that the level of creativity presented by university students is medium-low, 67.74% in women and 58.06% in men, which shows that teachers are not putting into practice teaching methods that develop creativity.

From the theoretical perspective on digital competence, it is based on the technological theory founded by Presnsky (2001) , who argued that the 1980s gave rise to digital technology and its massification in the highest socioeconomic levels and like this, from the 90s, increased with the appearance of the internet in homes. It is then that the first generation to grow up would be surrounded by the digital age such as digital technology, which would mean the relationship of the naturalness of the so-called digital natives or, in other words, the speakers of the digital language, giving them benefits and domains of graphic information to textual information, managing to process information quickly and differently from anyone who does not belong to the era of digitization; that is, the excluded called digital immigrants.

For Hanafi et al. (2020) , Acosta (2017) , Basantes et al. (2020) and Benavides and Chipana (2021) , the advance of the digital age has allowed the beginning of four phenomena that have gained greater strength in the collective imagination such as everyday life, the ease that young people have with digital management, the role that the digital in the lives of people and the undeniable impact that these have had in many areas such as economic, social and, predominantly, in education. These phenomena have allowed the fragmentation of the population into digital natives and others into digital immigrants in the face of technology and adding to this the social panic on the part of social networks.

The notoriety of digital natives has permeated so much that it caught the attention of the academy after 5 years since Presnsky's proposal (2001) where new theory and research show that access to technology presents a wide increase among young people; but this gap is shortened if trained adults can develop digital skills and thus expand opportunities and reduce exclusion in the digital age (Benavides and Chipana, 2021; Bernate et al., 2020; Bernate et al., 2020).)) . For Bordas et al. (2020) , Carrera et al. (2011) and Castellón and Jaramillo (2011) , the conceptualization of digital competence is a recent issue in the European community, which has allowed the level of interaction, communication, marketing in the field of broadcasts such as social networks and improvement of tools that come to be cataloged as skills that must be developed by human beings to achieve operability in the various demands of the knowledge society. Digital competence is a tool that allows planning, a means of organization that allows determined actions to increase the operability and classification of communication systems (Chiecher, 2020; Chiecher and Melgar, 2018) .

It started from the premise of competition, this allows the person to learn and observe new knowledge and skills (Zavala et al., 2016; Chou et al., 2016; Colás et al., 2017) . Digital competence, from the security approach, allows the use of

social information technologies from different contexts; for example, in work, entertainment and communication in order to communicate and participate in the development of collaborative networks through the internet efficiently and responsibly (Vólquez and Amador, 2020; Domínguez, 2019; Escobedo and Solórzano, 2018) .

Digital competence allows the practice and provision of skills in search of obtaining, processing and communicating information with the purpose of knowledge renewal (Escuder et al., 2020; Torres and Casillas, 2018) . Digital competence contains and encompasses a range of informative, communicative, creative elements allowing the understanding, recognition, location, conservation, organization and analysis of digital information, achieving the assessment, usefulness and relevance that allows emphasizing communication competence in digital environments. (Fernández, 2019; Rojas et al., 2020) .

Paa Fernandez et al. (2017) , Suarez et al. (2019) and Segrera et al. (2020) , digital competence focuses on the description and composition of capacities that the individual uses to obtain, value, store and socialize information. Digital skills are called instrumental technological elements that are made up of computer knowledge that is visualized in technology and is integrated into social networks and multimedia but, above all, into telecommunication media (Sarmiento, 2020; Fonseca et al., 2020; Flores and Garrido, 2019) .

For Sandí (2020) , Gálvez (2021) , García et al. (2021) , digital competence develops the aptitude factor that allows the use of Information Society Technology (IST) to be put into practice. Said competence groups a set of beliefs, values, knowledge, attitudes, abilities and skills development that emphasize the use and management of technologies through the internet (Georges, 2021; Ruiz et al., 2020; Romero and Aguaded, 2016) . From the perspective of the educational field, digital competences are the daily task within the development of interrelation and innovation skills among the members of the educational system (González et al., 2018; Grajales and Osorno, 2020; Rojas et al., 2020). . Digital competence in university teachers allows them to obtain new procedures to teach and learn in an equitable manner (Rodríguez, 2020; Guzmán and Gutiérrez, 2017; Hernández et al., 2015) .

From the theoretical about the development of creativity, it is described that the human being by his nature is myopic compared to the eagle; but this idea shows how the intelligence of the human being has come to see the invisible since the person has both physical and perceptual advantages emphasizing the confidence of the ideas found in the imagination taking into account the representations and abstractions of the context that surrounds it; in other words, creativity allows the link with the process of evolution. The theory affirms that creativity is a fundamental condition for societies to change in order to improve our lives and identify the keys to understanding the real paradigms of civilization (De Bono, 2004).

It is important to mention the theory of creativity proposed by Guilford (1950), cited by Artola and Barraca (2004) , who analyzes intelligence studies that had focused only on convergent thinking and Guilford took divergent thinking into

consideration, Later, it is developed and studied by De Bono; creativity is seen as a set of factors such as aptitude and this is developed through divergent production and transformational products; that is, divergent thinking or divergent production develops the ability to generate logical guide elements from existing information and this is evaluated based on the variety, quantity and relevance of a production.

For Limiñana et al. (2010) and Medina et al. (2019) , when talking about transformational products, emphasis is placed on the ability to imagine diverse changes; that is, redefinitions, transpositions, revisions and modifications of a given information. In other words, it is the ability that allows the use of informative data that is recorded in the memory in a new and different way, which implies having the capacity for flexibility of thought to delve into one's own and existing things, in such a way to offer new ideas. and interpretations before familiar elements and offer new use (Zambrano, 2019; Alvarado, 2018) .

There are several authors who define creativity such as Galán (2009) , for him creativity seen as the ability of the human being to associate the previously related ideas and the new schemes that are manifested in the interaction of an individual and the sociocultural context (Villalobos and Melo, 2020; Velásquez et al., 2010; Bejarano, 2012) . Creativity is a phenomenon of high complexity for its understanding and allows the individual to describe quality, capacity or ability to do or produce things in a new and original way.

According to Caballero et al. (2019) , Valero (2019) and Carreño et al. (2020) , from the beginning of the 19th century, in the western context, creativity was analyzed and considered as a capacity that gifted people or geniuses had. Currently, this idea is discussed by experts in the field, creativity does not only depend on genes, if it were so, there would be few people with the privilege of experimenting or creating (Do Carmo and De Souza, 2013) . That is why, in the 20th century, it was thought that creativity is not a purely exclusive characteristic of people genetically endowed with a quality of special talent; rather, it is a clearly characteristic characteristic of all human beings, with the difference that each one has forms and levels of expression, and to this we add the context, which is an important factor in the stimulation and development of creativity (Do Carmo and De Souza , 2013; Cuevas, 2013) .

In this regard, for Elisondo (2015) , Tristán and Mendoza (2016) and Suárez et al. (2019) , creativity is decisive because it allows the development of a society from the transversal logic of cultural, economic and educational policies; It is essential then to understand that creativity is not only about skills; but it transfers to another question that is to have a good disposition. Creativity must be developed in the construction of new learning; that is, developed by teachers as well as by students (Sosa, 2019; Hoyos and Pachón, 2017) .

Regarding creativity, De Bono (2004) argues that the new construct continues to revolve around the axis of vertical thinking, as an imperative aspect of including lateral thinking. Creativity allows teachers as students to make decisions to solve real problems in the context (Ríos and Bravo, 2017; Soriano and Pereira, 2017) . Creativity involves reframing problems.

According to Saavedra et al. (2020) , Parra et al. (2020) and Sánchez et al. (2021) , creativity is seen in different fields such as education, allowing the dynamization of the new construct. Creativity allows the capture of reality from the singular, achieving the generation and expression of new ideas, the practice of values and meanings, which implies facing daily tasks with the purpose of solving different problems, thus learning to overcome obstacles. and difficulties (Fernández, et al., 2019; Elisondo, 2018; Hoyos and Pachón, 2017) .

For Klimenko (2008) , Galán (2009) and Limiñana et al. (2010) , the characteristics of creativity, from philosophical and pedagogical science, describe these characteristics as being original, curious, thoughtful, divergent, spontaneous, flexible, sensitive, productive, effective, tenacious, independent and persevering, which allow creating new ideas and restructure existing things. For Morales (2017) and Pérez (2019) , creativity as a process took into account three fundamental elements of intelligence: a) creative intelligence, the person does not stay with the existing idea but goes further; that is, it creates new emerging ideas; b) analytical intelligence, the person, analyzes new ideas, evaluates them and solves problems; that is, they make decisions and c) practical intelligence, the person has the ability to transform abstract theories into original and effective ideas (Ortega, 2014) . Creativity is seen as the exposure of the socio-affective factor that allows to change and form the thought of the human being.

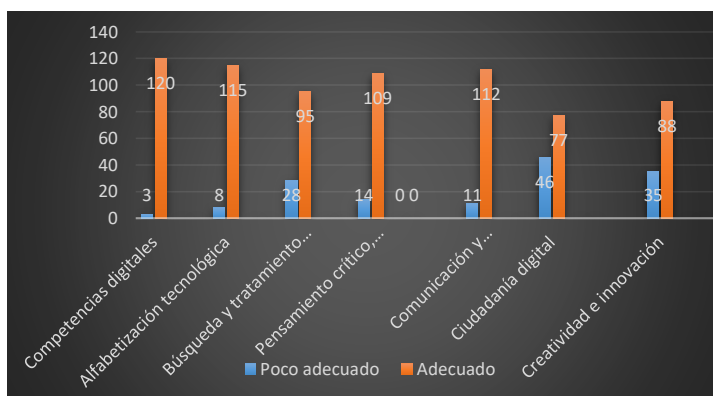
Method

We worked with the hypothetical-deductive method under the quantitative approach, associated with the positivist paradigm that takes into account a set of assumptions and postulates (Pimienta and De la Orden, 2012) . The study is basic aligned to the non-experimental design of the transectional-correlational-causal type; the sample consisted of 123 teachers from a public university in Lima. In the investigation, the technique used was the survey and the instrument was the questionnaire; the content that was reflected in said instrument were the items of the variables. Two questionnaires with a Likert scale were developed that described the key and pertinent points of the variables with their subvariables, the instruments went through the reliability process, obtaining values of 0.779 for digital skills and 0.802 for the instrument development of creativity, being located in a high reliability level. Likewise, the instruments passed through experts who certified the validity of the items. (Hernández and Mendoza, 2018).

Results

Figure 1

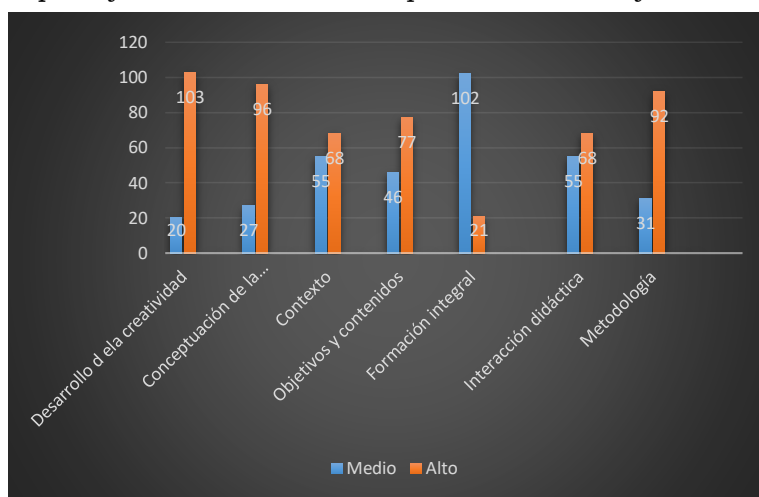
Levels and frequency of the digital skills variable and its dimension



In relation to the digital skills variable, of the total number of participating teachers, it is located at an adequate level with 97.6%, which represents 120, and 2.4%, at an inadequate level. With reference to the technological literacy dimension, 93.5% show an adequate level compared to 6.5% that is located at an inadequate level. With regard to the information search and treatment dimension, 77.2% of those surveyed demonstrate an adequate level and 22.8% are located at an inadequate level. On the critical thinking dimension, problem solving, 88.6% are at an adequate level, while 11.4% show an inadequate level. According to the communication and collaboration dimension of the total number of respondents, 91.1% have an adequate level, while 8.9% are at an inadequate level. Likewise, in the digital citizenship dimension, the respondents are located at an adequate level with 62.6% and 37.4% at an inadequate level. Finally, in the creativity and innovation dimension, of the total number of respondents, 71.5% are at the appropriate level and 28.5% at an inadequate level. It should be noted that both in the variable and in the dimensions, no teacher surveyed was located at an inappropriate level.

Figure 2

Levels and frequency of the variable development of creativity and its dimensions



Of the total number of teachers surveyed, it is located at a high level with 83.7%, which represents 103 of them, and 16.3%, at a medium level. With reference to the conceptualization dimension of creativity, 78.0% show a high level compared to 22.0% who are at a medium level. Regarding the context dimension, 55.3% of the participants demonstrate a high level and 44.7% are at a medium level. Regarding the objective and content dimension, 62.6% are at a high level, while 37.4% show a medium level. Regarding the comprehensive training dimension, of the total number of respondents, 17.1% demonstrate a high level, while 82.9% are at a medium level. Likewise, in the didactic interaction dimension, the respondents are located at a high level with 55.3% and 44.7%, at a medium level. Finally, in the methodology dimension, of the total number of respondents, 74.8% are at the high level and 25.2% at a medium level. It should be noted that both in the variable and in the dimensions, no teacher surveyed was located in a bad level.

Table 1
Adjustment of the model and Pseudo R2 that explains the influence of digital skills in the development of creativity

| Model | Loragithm of the likelihood | Chi squared | gl | Next. | Pseudo R squared | |
|-------------------|-----------------------------|-------------|----|-------|------------------|-------|
| intersection only | 14,130 | | | | Cox and Snell | 0.088 |
| Final | 2,831 | 11,299 | 1 | 0.001 | Nagelkerke | 0.528 |
| | | | | | McFadden | 0.401 |

Link function: Logit.

The contrast of the likelihood ratio indicated that the logistic model is significant with a Chi square of 11.299, demonstrating the significance of 0.001, a value lower than the α of 0.05, determining that digital skills significantly influence the development of creativity. Those of the Pseudo R squared indicated the presence of three coefficients that measure the proportionality and quality of the fit of the model. The Cox and Snell Coefficient indicated a value of 0.088, indicating that 8.8% of the development of creativity is explained by digital skills. In the Nagelkerke test, a value of 0.528 was obtained, indicating that 48.2% of the fit of the proposed model explains the dependent variable development of creativity. Finally, the McFadden Coefficient presented the value is 0.401, which indicated that 40.1% of the development of creativity is explained by the digital skills variable.

Table 2
Parametric test of the significant incidence between digital skills in the development of creativity

| Parameter estimates | | Estimate | Dev. Mistake | Wald | gl | Next | Confidence interval at 95% | |
|---------------------|--------------------------------|----------|--------------|----------|----|------|----------------------------|-------------|
| | | | | | | | Lower limit | Upper limit |
| Threshold | [Digital_competences = 2] | -22,225 | .626 | 1259,565 | 1 | ,000 | -23,452 | -20,998 |
| Location | [Development_of_creativity =2] | -20,490 | ,000 | . | 1 | . | -20,490 | -20,490 |
| | [Development_of_creativity =3] | 0a | . | . | 0 | . | . | . |

Link function: Logit.

This parameter is set to zero because it is redundant.

With reference to the estimation of the Wald parameter for said model adjustment, it was indicated that the digital competence variable responds significantly to the prediction of the creativity development variable with a level of 1259.565 and a significance value of 0.000; that is, it is less than α 0.05. What determines that, to the extent that digital skills are adequate, the development of creativity will be positively influenced.

Discussion

Of the results referring to digital competence, 2.4% are of an inadequate level; that is, that the mastery of digital skills in teachers must be improved. The results obtained are similar to the results of Domínguez (2019), who explained that it is necessary to establish a model based on the development of competencies, focusing on the training of pedagogical professionals, thus allowing them to create and imagine learning as an accessible element and thus having the ability to extrapolate in the different context and times, combining elements of modality and moments of academic learning, achieving the optimization of professional instruction in student well-being.

Regarding the technological literacy dimension that refers to digital skills, 6.5% are at an inadequate level. This result is different from those of Fernández et al. (2017), who explain that teachers, during class, frequently use information technology on different devices and use it appropriately. Regarding the dimension search and treatment of information regarding digital skills, 22.8% consider an inadequate level, indicating that it is essential that teachers master digital skills because a search and treatment of the information they obtain will depend on it. on the Internet. The results are similar to those of López et al. (2021), who maintained the low level of mastery of teachers' digital skills, this being a difficulty in using virtual platforms, which makes teaching actions complicated and, above all, the development of the teaching-learning process.

Regarding the communication and collaboration dimension referring to digital skills, 22.8% present an inadequate level, explaining that teachers have little or almost little command of digital skills, which tends to hinder the use of technology, which is essential. in remote or distance classes. These results are different from those of Laurente et al. (2020), who argued that university teachers have managed to find new ways of teaching and learning by combining face-to-face learning experiences and the virtual context, achieving interaction, communication, and collaboration using tools and putting digital skills into practice. .

Of the digital citizenship dimension referring to digital skills, 37.4% consider an inadequate level, indicating that the lack of inter-learning networks between teachers is important because it allows digital interaction between peers and by demonstrating an inadequate level. interaction between peers is a limitation. The results are similar to those of Medina et al. (2019), who affirm the importance that teachers have to keep in mind inclusion as a creative method making use of

technologies to enable the development of creativity in students, generating creative students in university classrooms.

In the creativity and innovation dimension, it is argued that, in digital skills, 28.5% consider an inadequate level, indicating the lack of imagination and creativity of teachers, being a difficulty for students to develop creativity and do use of technology and that they can manage to develop digital skills. These results are similar to those of Hurtado (2021), who concluded that the level of creativity presented by university students is located at a medium-low level of 67.74% in women and 58.06% in men, demonstrating that teachers are not putting into practice teaching methods that develop creativity.

Of the results of the context dimension of the development of creativity, 44.7% maintain that it is medium level. These results are similar to Levano et al. (2019), who concluded that university teachers and the context of universities must be at the forefront of transformations both in infrastructure-university and in the academic-teacher character. Likewise, the results of the objectives and contents dimension of the development of creativity, 37.4% of the participants present a medium level. The results are similar to those of Alvarado (2018), who argued that, within the teaching-learning process, the constant problem is the low production of ideas and that it is a relevant problem that should be faced in a creative way so that teachers and students be more creative and that the contents on the different themes are developed by putting imagination and creativity into practice.

Of the results in comprehensive training of the development of creativity, of the respondents, 17.1% is located at a medium level, in the same way the didactic interaction dimension with a 44.7 medium level, indicates the lack of strategies by the teacher and how they are generating difficulty in developing imagination and creativity in teachers and the lack of comprehensive training making it difficult to obtain good results. The results are similar to those of Domínguez (2019), who argued that it is important to relate models based on the development of competencies, focusing on the training of pedagogical professionals that allows creating and imagining learning as an accessible element and that has the capacity to extrapolate in the different contexts and times. Finally, from the results of the methodology dimension of the development of creativity, 25.2% of the participants present a medium level. The results differ from those of Saavedra et al. (2020), who argued that, with the pedagogy developed by the teachers, the students developed creativity and critical thinking, determining that the pedagogy of creativity has positive effects.

Conclusions

It is concluded that Wald parameter estimates of 1259.565 with a significance of $=.000$ were demonstrated, indicating that digital skills respond to the prediction of the coercive measure of the development of creativity, in addition, the adjustment of the model and Pseudo R² demonstrates a Nagelkerke value of 0.528, pointing out that the development of creativity is explained by digital skills and the likelihood test indicates that the logistic model is significant with a Chi square of 11.299, indicating that digital skills significantly influence creativity.

Therefore, to the extent that digital skills are adequate or better, then the development of creativity will be positively influenced.

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